

## CLAIMS

What is claimed is:

1. An apparatus enabling synchronization of network traffic with at least one  
5 network device, comprising
  - a first network interface for communication with a first network device;
  - a second network interface for communication with a second network device;
  - at least a third network interface for exchange of synchronization packets with  
a partner network device;
  - 10 a control module operative to
    - receive data packets on the first and second network interfaces,  
wherein the data packets are addressed to destination hosts;
    - receive synchronization packets on the at least a third network  
interface;
    - 15 transmit, on the at least a third network interface, the data packets  
received on the first network interface as synchronization packets to the partner  
network device;
    - transmit, on the at least a third network interface, the data packets  
received on the second network interface as synchronization packets to the partner  
20 network device;
    - process the received data packets and the synchronization packets.
2. The apparatus of claim 1 wherein the control module is further operative to  
discard the synchronization packets before transmitting the data  
25 packets to the destination hosts.
3. The apparatus of claim 1 further comprising a fourth network interface for  
exchange of synchronization packets with the partner network device; and wherein  
the control module is operative to

transmit, on the third network interface, the data packets received on the first network interface as synchronization packets to the partner network device;  
transmit, on the fourth network interface, the data packets received on the second network interface as synchronization packets to the partner network  
5 device.

4. The apparatus of claim 1 wherein the control module is further operative to encapsulate the data packets received on the first and second network interfaces with synchronization headers before transmitting the data packets on the  
10 at least a third network interface, and  
decapsulate the synchronization packets received on the at least a third network interface network interface.

5. The apparatus of claim 4 wherein the control module is further operative to  
15 include meta information relating to the data packets in the synchronization header.

6. The apparatus of claim 1 wherein the first network interface is a wired network interface.  
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7. The apparatus of claim 1 wherein the first network interface is a wireless network interface.

8. The apparatus of claim 1 wherein the at least a third network interface is a  
25 wireless network interface.

9. The apparatus of claim 3 wherein the fourth network interface is a wireless network interface.

10. The apparatus of claim 1 wherein the control module is further operative to verify the packets received on the at least a third network interface.
11. The apparatus of claim 10 wherein the synchronization packets include a magic  
5 identifier, and wherein the control module is operative to verify the packets received on the at least a third network interface by validating the magic identifier.
12. The apparatus of claim 10 wherein the control module is further operative to include magic identifiers to synchronization packets transmitted on the at least a  
10 third network interface.
13. The apparatus of claim 1 wherein the control module is further operative to compose summary versions of the packets received on the first and second network interfaces and transmit the summary versions as synchronization packets on the at  
15 least a third network interface.
14. The apparatus of claim 13 wherein the summary versions each comprise a packet header and a payload size.
- 20 15. A method directed to synchronization of network traffic with at least one partner network device, comprising  
receiving data packets on first and second network interfaces, wherein the data packets are addressed to destination hosts;  
receiving synchronization packets on at least a third network interface from at  
25 least one partner network device;  
transmitting, on the at least a third network interface, the data packets received on the first network interface as synchronization packets to at least one partner network device;

transmitting, on the at least a third network interface, the data packets received on the second network interface as synchronization packets to the at least one partner network device;

processing the received data packets and the synchronization packets; and

5 discarding the synchronization packets before transmitting the data packets to the destination hosts.

16. A system, comprising

a first network device operably connected to a first communication path in a  
10 computer network,

a second network device operably connected to a second communication path in the computer network,

wherein the first network device is operably connected to the second network device to transmit and receive synchronization packets,

15 wherein the first and second network devices are each operative to:

receive data packets traversing a communications path to destination hosts,

transmit the data packets received on the communications path to at least one partner network device,

20 receive synchronization data packets from at least one partner network device,

flag synchronization data packets received from the at least one partner network device,

process the data packets traversing the communications path and the  
25 synchronization packets received from the at least one partner network device,

discard the synchronization packets before transmitting the data packets along the communications path to the destination hosts.

17. The system of claim 16 wherein the first and second network devices are each  
30 further operative to

encapsulate the data packets received on the communications path with synchronization headers before transmitting the data packets to the at least one partner network device, and

decapsulate the synchronization packets received from the at least one  
5 partner network device.

18. The system of claim 17 wherein the first and second network devices are each further operative to

include meta information relating to the data packets in the synchronization  
10 header.

19. The system of claim 16 wherein the first and second network devices each comprise

a first network interface for communication with a first computer network;

15 a second network interface for communication with a second computer network;

at least a third network interface for exchange of synchronization packets with a partner network device;

a control module operative to  
20 receive data packets on the first and second network interfaces,  
wherein the data packets are addressed to destination hosts;

receive synchronization packets on the at least a third network interface;

transmit, on the at least a third network interface, the data packets  
25 received on the first network interface as synchronization packets to the partner network device;

transmit, on the at least a third network interface, the data packets received on the second network interface as synchronization packets to the partner network device;

30 process the received data packets and the synchronization packets; and

discard the synchronization packets before transmitting the data packets to the destination hosts.

20. The system of claim 19 wherein the first and second network devices further  
5 comprise a fourth network interface for exchange of synchronization packets with  
the partner network device; and wherein the control module is operative to  
transmit, on the third network interface, the data packets received on  
the first network interface as synchronization packets to the partner network device;  
transmit, on the fourth network interface, the data packets received on  
10 the second network interface as synchronization packets to the partner network  
device.

21. The system of claim 19 wherein the control module is further operative to  
encapsulate the data packets received on the first and second network  
15 interfaces with synchronization headers before transmitting the data packets on the  
at least a third network interface, and  
decapsulate the synchronization packets received on the at least a third  
network interface network interface.

20 22. The system of claim 21 wherein the control module is further operative to  
include meta information relating to the data packets in the synchronization  
header.

23. The system of claim 19 wherein the first network interface is a wired network  
25 interface.

24. The system of claim 19 wherein the first network interface is a wireless network  
interface.

25. The system of claim 19 wherein the at least a third network interface is a wireless network interface.

26. The system of claim 20 wherein the fourth network interface is a wireless  
5 network interface.

27. A bandwidth management device operative to synchronize network traffic data with at least one other bandwidth management device comprising

- a first network interface for communication with a first computer network;
- 10 a second network interface for communication with a second computer network;
- at least a third network interface for exchange of synchronization packets with at least one partner bandwidth management device;
- a bandwidth management module operative to
- 15 receive data packets on the first and second network interfaces, wherein the data packets are addressed to destination hosts;
- receive synchronization packets on the at least a third network interface;
- transmit, on the at least a third network interface, the data packets
- 20 received on the first network interface as synchronization packets to the partner network device;
- transmit, on the at least a third network interface, the data packets received on the second network interface as synchronization packets to the partner network device;
- 25 process the received data packets and the synchronization packets;
- enforce bandwidth utilization controls on the data packets received at the first and second network interfaces; and
- discard the synchronization packets before transmitting the data packets to the destination hosts.

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28. The bandwidth management device of claim 27 wherein processing of the synchronization packets influences enforcement of the bandwidth utilization controls on the data packets received at the first and second network interfaces.

5 29. The bandwidth management device of claim 27 further comprising a fourth network interface for exchange of synchronization packets with the partner network device; and wherein the control module is operative to  
transmit, on the third network interface, the data packets received on  
the first network interface as synchronization packets to the partner network device;  
10 transmit, on the fourth network interface, the data packets received on  
the second network interface as synchronization packets to the partner network device.

30. The bandwidth management device of claim 27 wherein the control module is  
15 further operative to  
encapsulate the data packets received on the first and second network  
interfaces with synchronization headers before transmitting the data packets on the  
at least a third network interface, and  
decapsulate the synchronization packets received on the at least a third  
20 network interface network interface.

31. The bandwidth management device of claim 30 wherein the control module is  
further operative to  
include meta information relating to the data packets in the synchronization  
25 header.

32. The bandwidth management device of claim 27 wherein the first network interface is a wired network interface.



33. The bandwidth management device of claim 27 wherein the first network interface is a wireless network interface.

34. The bandwidth management device of claim 27 wherein the at least a third network interface is a wireless network interface.

35. The bandwidth management device of claim 29 wherein the fourth network interface is a wireless network interface.

36. An apparatus enabling synchronization of network traffic with at least one network device, comprising

- at least a first network interface for communication with a first network device;
- at least one synchronization interface for exchange of synchronization packets with a partner network device;
- a control module operative to
  - receive data packets on the at least a first network interface, wherein the data packets are addressed to destination hosts;
  - receive synchronization packets on the at least one synchronization interface;
  - transmit, on the at least one synchronization interface, the data packets received on the at least a first network interface as synchronization packets to the partner network device;
  - process the received data packets and the synchronization packets.